

REMARKS

Reconsideration of this application, based on this amendment and these following remarks, is respectfully requested.

Claims 1 through 7 and 11 through 15 remain in this case. Claim 2 is amended.

Applicant notes the objection to claim 2. Claim 2 is amended to address this objection.

Applicant also notes the indication by the Examiner that claims 11 through 15 are allowed, and that claim 2 is directed to allowable subject matter (but remains objected to as dependent on a rejected claim).

Claims 1, 5, and 6 were rejected under §103 as unpatentable over the Uchiyama reference¹. The Examiner asserts that the reference discloses its units 6 and 9 "act as a tracking buffer for tracking a plurality of coefficients for timing drift".² The Examiner further asserts that centering of the plurality of coefficients occurs in equalizer 5 of the reference, which also filters the signal with that plurality of coefficients, and that the reference also teaches the updating of the plurality of coefficients in the equalizer.³

The Examiner again states that, while the Uchiyama reference differs from claim 1 because it does not disclose the updating and centering of the plurality of the coefficients in the tracking buffer rather than in the equalizer, this difference is no more than an obvious design choice.⁴ The Examiner bolsters this conclusion by urging that the coefficients center and update in equalizer 5 and then store to buffers 15, 9, 10 according to the Uchiyama reference, which is simply a design choice as compared to the centering of the plurality of coefficients in the tracking buffer as claimed.⁵

¹ U.S. Patent No. 5,228,060, issued July 13, 1993 to Uchiyama.

² Office Action of March 4, 2004, page 3.

³ *Id.*

⁴ *Id.*

⁵ *Id.*

Applicant respectfully traverses the §103 rejection of claim 1, on the grounds that the rejection is based on a misinterpretation of the reference.

Claim 1 is directed to a method for timing recovery of a digital signal in a telecommunications receiver. In the claimed method, the digital signal is filtered through an equalizer, with a plurality of coefficients. The method requires tracking the plurality of coefficients in a tracking buffer for timing drift, and centering the plurality of coefficients in that tracking buffer. As described in the specification, this method provides the important advantages of ensuring that the largest coefficients remain centered and do not migrate out of the filter, even as an adaptive equalizer updates the coefficients.⁶ Improved fidelity and reliability in the receipt of digital communications signals is thus provided.

Applicant maintains his arguments as presented in the Amendment of February 9, 2004. To further address the rejection in this case, Applicant also submits these additional arguments.

Applicant submits that the reference fails to teach the centering of coefficients in an equalizer, as required by claim 1, contrary to the assertion by the Examiner. The Examiner again cited a particular location of the Uchiyama reference⁷ as teaching the centering of coefficients in the equalizer. However, that location of the reference fails to disclose the centering of any coefficients, nor is such centering disclosed elsewhere in the reference.

The cited location of the reference discloses the determining of an evaluation parameter $Ter(k)$ as the difference between successive coefficient ratios of the center tap coefficient to a next tap in the equalizer; this evaluation parameter can indicate a sudden phase shift.⁸ That location of the reference also discloses determining another evaluation parameter $Cer(k)$ corresponding to the difference between each equalizer coefficient at a time k and a corresponding coefficient at the previous time $k-1$. However, nowhere does this portion of the specification disclose the centering of coefficients, much less the centering step of claim 1, even if one were to accept that the reference teaches a tracking buffer (which it does not).

⁶ Specification of S.N. 09/713,580, page 6, line 2 through page 7, line 2.

⁷ Uchiyama, *supra*, column 5, line 67 through column 6, line 15.

⁸ *Id.*

The absence of any centering act disclosed by the Uchiyama reference is especially apparent from a plain reading of the reference itself. The reference clearly discloses that the evaluation parameters of $Ter(k)$ and $Cer(k)$ are examined to determine whether any is "unusual"; if not, the current state data is stored in buffers, and if so, the stored state data is retrieved from the buffers and supplied to the equalizer 5.⁹ In neither case, and indeed in no other case, is there any disclosure or suggestion from the Uchiyama reference to center the coefficients in the equalizer.

Applicant agrees that the Uchiyama reference teaches the updating of the tap coefficients in its equalizer 5.¹⁰ But nowhere does the reference anywhere teach that the updated coefficients are centered in the equalizer, centered in any buffer, or centered anywhere.

Accordingly, Applicant submits that the rejection is in error, as based on a faulty interpretation of the Uchiyama reference.

Applicant again respectfully maintains that claim 1 is patentably distinct over the Uchiyama reference, on the grounds that there is no suggestion from the prior art or otherwise to modify the teachings of the reference in such a manner as to reach the claim.

For the reasons discussed above, the Uchiyama reference fails to disclose the centering step of claim 1. Applicant submits that there is no suggestion to modify the teachings of the reference to provide such centering as claimed. This lack of suggestion is especially apparent given the significant difference between the purpose and function of the system disclosed in the Uchiyama reference and that of the invention of claim 1.

As mentioned above, the circuitry of the Uchiyama system detects a "disturbance" in the incoming signal, and then ensures that the adaptive equalizer coefficients are not modified by the disturbance to such a divergent extent that the modem hangs up.¹¹ According to the

⁹ Uchiyama, *supra*, column 6, lines 28 through 37.

¹⁰ See Uchiyama, *supra*, column 5, lines 36 through 38.

¹¹ Uchiyama, *supra*, column 3, lines 39 through 51.

Uchiyama teachings, upon detecting a disturbance in the signal, the previous state of the equalizer is maintained, and used again once the disturbance is over.¹²

On the other hand, the purpose and effect of the method of claim 1 is to ensure that adaptive equalizer coefficients remain substantially centered within the equalizer, even in the face of timing drift between the transmitter and receiver, which can cause the adaptively adjusted equalizer coefficients to drift one way or the other.¹³ In the method of claim 1, this is accomplished by tracking and centering the plurality of coefficients in the tracking buffer.

It is therefore readily apparent that the Uchiyama reference itself nowhere suggests modifying its own teachings by including a step of centering the plurality of coefficients, as required by claim 1. The Uchiyama reference handles timing drift in the conventional way,¹⁴ and, to the extent that it does teach management of the equalizer coefficients, its intent is to inhibit modifying those coefficients in the event of a brief signal disturbance. Accordingly, any suggestion to modify the teachings of the Uchiyama reference in such a manner as to reach claim 1 is necessarily based on the improper use of Applicant's own teachings in hindsight.

In response to Applicant's arguments in the Amendment of claim 9, the Examiner points out that "we do not examine the patents based only on the purpose(s) of the reference(s)".¹⁵ Applicant respectfully asserts that he is not arguing differences in purpose as the basis for patentability. However, Applicant urges that the difference in purpose between the Uchiyama reference and the claimed invention illustrates that the reference fails to teach the centering step required by claim 1, and that this difference in purpose also illustrates the absence of any suggestion from the Uchiyama reference to modify its teachings to provide such centering. Accordingly, Applicant respectfully submits that the critique of his arguments by the Examiner is misplaced.

¹² Uchiyama, *supra*, column 5, lines 36 through 46.

¹³ Specification, *supra*, page 6, line 2 through page 7, line 2.

¹⁴ Uchiyama, *supra*, column 4, lines 39 through 49.

¹⁵ Office Action, *supra*, page 2, ¶1.

For these reasons, Applicant traverses the §103 rejection of claim 1, and submits that the claim is patentably distinct over the applied prior art.

Claims 3 and 4 were rejected under §103 as unpatentable over the Uchiyama reference in view of the Qureshi et al. reference.¹⁶ The Examiner asserts that the Uchiyama reference fails to disclose the splitting of the signal into in-phase and quadrature-phase signals, but that such splitting is disclosed by the Qureshi et al. reference, which would have been obviously combined with the Uchiyama reference to reach the claims.¹⁷

Applicant also respectfully traverses the rejection of claims 3 and 4, on the grounds that the combined teachings of the references fall short of the requirements of claim 3, and that there is no suggestion to modify the teachings of the reference to reach the claim.

As previously argued, claim 3 is directed to a method for timing recovery, in which the incoming digital signal is split into in-phase and quadrature input signals, and are filtered through in-phase and quadrature equalizers, respectively. The claim further requires tracking, for timing drift and in a tracking buffer, a plurality of in-phase coefficients used in the in-phase equalizer, and centering these in-phase coefficients (as well as the quadrature coefficients) in the tracking buffer. Claim 4 further recites, relative to claim 3 upon which it depends, the tracking of the quadrature coefficients in the tracking buffer. The method of claims 3 and 4 provide similar advantages as discussed above relative to claim 1, ensuring that the largest coefficients remain centered and do not migrate out of the filter, even as an adaptive equalizer updates the coefficients for timing drift.

Similarly as argued above relative to claim 1, Applicant submits that the Uchiyama reference does not disclose the centering of a plurality of in-phase and quadrature-phase coefficients in any element, much less in a tracking buffer as required by claim 3. Again, the cited location of the reference fails to disclose the centering of any coefficients in an equalizer or otherwise. Instead, the Uchiyama reference teaches, at the cited location, the calculation of

¹⁶ U.S. Patent No. 4,004,226, issued January 18, 1977, to Qureshi et al.

¹⁷ Office Action, *supra*, page 4.

various evaluation parameters that indicate a disturbance in the incoming received signal. No centering of coefficients is disclosed at that location, nor is such centering disclosed elsewhere in the reference. While the Qureshi et al. reference mentions the centering of coefficients in an equalizer, such centering is only disclosed as being effected by "gradual timing adjustment" with reference to the equalizer itself;¹⁸ no disclosure or suggestion of the use of a tracking buffer as claimed is present in the reference. For this reason, Applicant submits that the rejection of claim 3 is in error, and that the Uchiyama and Qureshi et al. references fall short of the requirements of claim 3 by nowhere disclosing the recited centering steps.

Applicant further respectfully submits that that there is no suggestion to modify the teachings of the applied references in such a manner as to reach claims 3 and 4.

As discussed above, both of the Uchiyama and the Qureshi et al. references fail to disclose the centering steps of claim 3. Applicant submits that there is no suggestion to modify the teachings of the reference in such a manner as to reach the claims, considering that the Uchiyama reference is directed to the inhibiting of the modification of the adaptive equalizer coefficients in the event of a "disturbance" in the incoming signal, and teaches the storing of the equalizer state upon detecting such a disturbance and using this stored state once the disturbance is over. To the extent that timing recovery is disclosed in the Uchiyama reference, the reference teaches adjusting the timing of its analog-to-digital converter, similarly as the conventional approach shown in Figure 1 of this application. And the Qureshi et al. reference adds no teachings or suggestion regarding the use of a tracking buffer, as required by the claims. In contrast, the method of claims 3 and 4 ensures that the adaptive equalizer coefficients remain substantially centered within the equalizer, even in the face of timing drift between the transmitter and receiver, by way of the recited tracking and centering steps.

Nowhere does the Examiner anywhere support the assertion that the use of a tracking buffer to center coefficients of an equalizer, rather than the equalizer itself, is a design choice. As discussed above relative to claim 1, the buffer of the Uchiyama reference is used only to store existing coefficients for use in the event of a disturbance. Even if one were to combine the

¹⁸ Qureshi et al., *supra*, , column 5, line 60, to column 6, line 29.

Uchiyama and Qureshi et al. references, there is still no suggestion to center the equalizer coefficients using a tracking buffer as claimed. Accordingly, any suggestion to modify the combined teachings of the Uchiyama and Qureshi et al. references in such a manner as to reach claims 3 and 4 must only come from the improper use of Applicant's own teachings in hindsight.

For these reasons, Applicant submits that claims 3 and 4 are patentably distinct over the applied references.

As mentioned above, claims 5 and 6 were rejected under §103 as unpatentable over the Uchiyama reference. The Examiner asserts that the reference discloses all of the elements of the claim as discussed above relative to claim 1, and further discloses controller 8 that shifts coefficients to remain centered in the equalizer, which the Examiner asserts corresponds to the buffer manager of claim 5. The Examiner states that the reference does not disclose the shifting of the coefficients in a tracking buffer, rather than the equalizer, but that this difference amounts to design choice.¹⁹

Similarly as discussed above relative to claim 1, Applicant respectfully traverses the rejection of claim 5, on the grounds that it is based on a misinterpretation of the reference.

As stated above, Applicant respectfully submits that the Uchiyama reference does not teach centering of the coefficients in an equalizer, in a tracking buffer, or in any element. The reference instead teaches that certain evaluation parameters are calculated to determine whether a disturbance is present in the incoming signal, and if so to use previously-stored coefficients for the equalizer. The timing recovery disclosed by the Uchiyama reference is simply the conventional approach of adjusting the clock of its analog-to-digital converter; nowhere does the reference disclose the centering of its equalizer coefficients, much less by the operation of a buffer manager that tracks and shifts equalizer coefficients within a filter buffer, as required by claim 5. Accordingly, Applicant respectfully submits that the §103 rejection of claim 5 and its dependent claims is based on a misinterpretation of the reference, and is in error.

¹⁹ Office Action, *supra*, pages 3 and 4.

Applicant further respectfully submits that there is no suggestion to modify the teachings of the Uchiyama reference in such a manner as to reach claim 5. This lack of suggestion is clearly apparent from the divergent purpose of the Uchiyama teachings (*i.e.*, to inhibit updating of the adaptive equalizer coefficients because of a disturbance) from the purpose of the claimed invention (*i.e.*, to maintain the adaptive equalizer coefficients centered within the filter). This lack of coherence in purpose negates any suggestion to modify the teachings of the reference, except by the improper hindsight application of Applicant's own teachings. Nor is there any suggestion to modify these teachings from the other prior art references of record in this case. For example, the Qureshi et al. reference, applied against claims 3 and 4 also fails to disclose or suggest a buffer manager for tracking and shifting equalizer coefficients within a filter buffer, and the Grimwood et al. reference²⁰ applied against claim 7 was neither asserted as showing such a buffer manager, nor is such a function disclosed by the reference.

For these reasons, Applicant respectfully submits that claims 5 through 7 are also patentably distinct over the prior art of record in this case.

²⁰ U.S. Patent No. 6,243,369 B1, issued June 5, 2001 to Grimwood et al.

For the above reasons, Applicant respectfully submits that all claims now in this case are in condition for allowance. Reconsideration of this application is therefore respectfully requested.

Respectfully submitted,



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